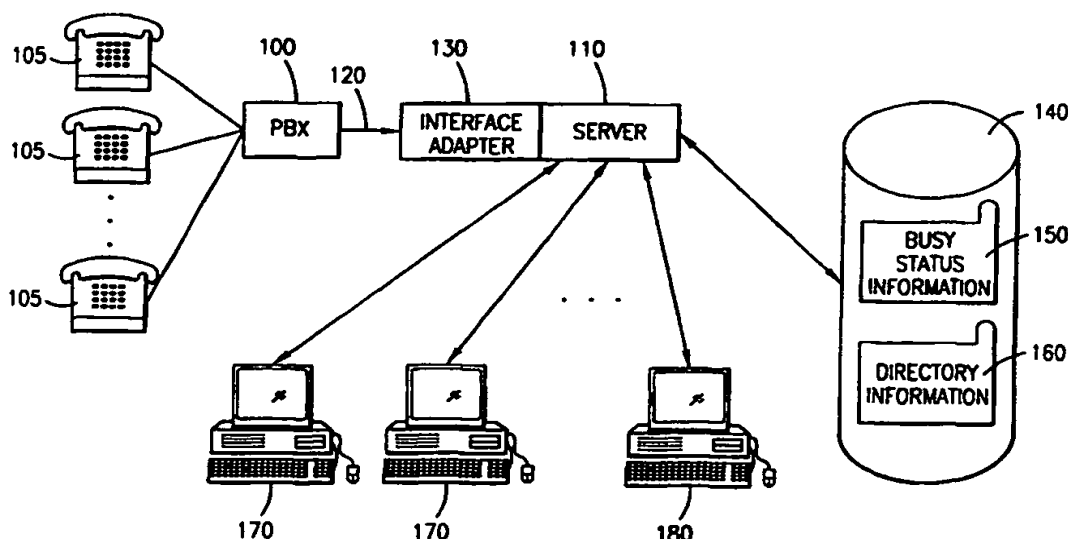




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(21) International Application Number: PCT/US98/14762 (22) International Filing Date: 16 July 1998 (16.07.98) (30) Priority Data: 08/895,855 17 July 1997 (17.07.97) US (71) Applicant: ERICSSON INC. [US/US]; 7001 Development Drive, P.O. Box 13969, Research Triangle Park, NC 27709 (US). (72) Inventor: LAM, Cory; 3010 Aptos Avenue, Hacienda Heights, CA 91745 (US). (74) Agents: MOORE, Stanley, R. et al.; Jenkins & Gilchrist, P.C., Suite 3200, 1445 Ross Avenue, Dallas, TX 75202 (US).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: METHOD AND APPARATUS FOR MAINTAINING REAL-TIME BUSY STATUS INFORMATION OF TELEPHONE EXTENSIONS IN A PRIVATE BRANCH EXCHANGE

**(57) Abstract**

A method and apparatus for maintaining real-time busy status information for a plurality of telephone extensions connected to a Private Branch Exchange (PBX). The invention includes a database for storing busy status information obtained by a server from signaling information generated by the PBX. The signaling information is obtaining via a communication link connecting the PBX and the server. The present invention further includes an interface adapter for converting the protocol of the signaling information into a protocol suitable for storing the busy status information in the database by the server.

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**METHOD AND APPARATUS FOR MAINTAINING REAL-TIME
BUSY STATUS INFORMATION OF TELEPHONE
EXTENSIONS IN A PRIVATE BRANCH EXCHANGE**

5 BACKGROUND OF THE INVENTION

Technical Field of the Invention

The present invention pertains in general to an apparatus for maintaining real-time busy status information in a telephone network, and more particularly, to a method and apparatus for maintaining real time busy status information for a plurality of telephone extensions in a private branch exchange.

Description of Related Art

15 In the small Private Branch Exchange (PBX) market, an operator station typically includes a "busy lamp field" display for displaying busy status information of all telephone extensions connected to the PBX. The display includes green and red light emitting diodes to indicate whether a particular extension is on-hook or off-hook. The display allows an operator to determine whether the telephone extension is currently engaged in a conversation when attempting to connect a caller to the telephone extension. As the number of telephone extensions supported by the PBX grows, however, implementing the busy lamp field display becomes infeasible due to physical limitations in placing the large number of extension indicators on the display panel. Nevertheless, there remains a demand in the marketplace to provide the busy lamp field functionality. Furthermore, in the computer telephony area there is also a demand to provide busy lamp field functionality to other telephone extensions supported by the PBX such that subscribers do not attempt to place a call to telephone extensions which are already busy. It would be advantageous therefore, to devise

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a method and apparatus which provides busy lamp field functionality to both an operator station and to subscribers supported by the PBX regardless of the total number of telephone extensions supported by the PBX.

5

SUMMARY OF THE INVENTION

The present invention comprises an method and apparatus for maintaining real-time busy status information for a plurality of telephone extensions connected to a Private Branch Exchange (PBX). The invention includes a database for storing busy status information obtained by a server from signaling information generated by the PBX. The signaling information is obtained via a communication link connecting the PBX and the server. The present invention further includes an interface adapter for converting the protocol of the signaling information into a protocol suitable for storing the busy status information in the database by the server.

20

BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the present invention, reference is made to the following detailed description taken in conjunction with the accompanying drawings wherein:

25

FIGURE 1 is a functional block diagram of a preferred embodiment of the present invention;

FIGURE 2 depicts three display screens illustrating three formats for displaying busy status information; and

30

FIGURE 3 is a flow diagram of a method for implementing the preferred embodiment of the present invention described in Fig. 1.

DETAILED DESCRIPTION OF THE INVENTION

35

Referring now to Fig. 1, there is illustrated a functional block diagram of a preferred embodiment of the present invention. A Private Branch Exchange (PBX) 100,

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serving a plurality of telephone extensions 105, is connected to a server 110 via a communications link 120 and an interface adapter 130. The server 110 communicates with a database 140 containing busy status information 150 and directory information 160. The directory information 160 contains information regarding subscribers connected to the PBX 100 such as a name director and corresponding telephone extension numbers. The server 110 also communicates with a plurality of terminals 170 including an operator station 180.

When one of the telephone extensions 105 goes off-hook or on-hook, the PBX 100 generates signaling information indicative of the transition. The signaling information is communicated to the server 110 via the communication link 120. Any type of communication link 120 can be used, however, in the preferred embodiment the link is effectuated using a Transport Control Protocol/Internet Protocol (TCP/IP) link. In the event that the protocol used by the PBX 100 to generate the signaling information is incompatible with the protocol used by the server 110 and the database 140, an interface adapter 130 converts the signaling information to a protocol suitable for use by the server 110. For example, the interface adapter 130 can be used to convert proprietary signaling information of an Ericsson MD 110 PBX to standard Computer Supported Telecommunications Application (CSTA) protocol for processing by the server 110.

Upon receiving notification of a transition to an on-hook or off-hook state, the server 110 updates the busy status information 150 contained in database 140. The busy status information 150 can be maintained independently, or alternatively, can be stored together with the directory information 160. If the busy status information 150 is stored together with the directory information 160, the busy status of subscribers can be determined when searching directory information 160. The

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busy status information 150 associated with each telephone extension 105 may also be assigned different colors such as red and green and/or various icon designs with the particular color or icon design representative of the current busy status of the particular telephone extension 105.

The server 110 also communicates with various terminals 170 and an operator station 180. Communication can be effectuated over any communication network such as direct connections or via a local area network. In the preferred embodiment, terminals 170 and operator station 180 are personal computers, however, they may also be a desk top application running on other computing devices. The server 110 retrieves from the database 140 and broadcasts busy status information 150 to terminals 170 which are subscribers of real-time notification and the operator station 180, or alternatively, the busy status information 150 can be retrieved and transmitted in response to a request from the terminals 170 or operator station 180.

Referring additionally now to Fig. 2, there is illustrated a first display screen 200, a second display screen 210, and a third display screen 220 which can be connected to either the terminals 170 or the operator station 180. The busy status information 150 can be displayed in any format by the terminals 170 and operator station 180. For example, the first screen 200 is programmed to resemble a busy lamp field display including a red indicator 230 and a green indicator 240. When the particular extension is on-hook the red indicator 230 is illuminated and when the extension is off-hook the green indicator 240 is illuminated.

In the second display screen 210, the names of the subscribers associated with each telephone extension is listed in a directory. If the particular extension is on-hook the name of the subscriber is colored in red as is illustrated in the Fig.2 by the bold lettering 250. If

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the particular extension is off-hook the name of the subscriber is colored in green as is illustrated by italic lettering 260.

5 In a third display screen 220, an icon is used to indicate the busy status of the extensions. If the particular extension is on-hook a first icon 270 is located next to the name of the subscriber. If the particular extension is off-hook a second icon 280 is located next to the name of the subscriber.

10 Referring additionally now to Fig. 3, there is illustrated a flow diagram of a method for implementing the preferred embodiment of the present invention described in Fig. 1. The server 110 obtains signaling information (step 300) generated by the private branch
15 exchange 100; the signaling information being indicative of a change in the status of a telephone extension 105. In certain situations where the protocol of the signaling information generated by the private branch exchange 100 differs from the protocol used by the server 110, the
20 interface adapter 130 converts the protocol of the signaling information (step 310) from the protocol used by the private branch exchange 100 to the protocol used by the server 110. After obtaining the signaling information, the server 110 updates status information 150
25 (step 320) contained in the data base 140. The server 110 also broadcasts changes in the status of telephone extensions 105 (step 330) to subscribers of real-time notification.

30 Although a preferred embodiment of the method and apparatus of the present invention has been illustrated in the accompanying Drawings and described in the foregoing Detailed Description, it is understood that the invention is not limited to the embodiment disclosed, but
35 is capable of numerous rearrangements, modifications, and substitutions without departing from the spirit of the invention as set forth and defined by the following claims.

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WHAT IS CLAIMED IS:

1. An apparatus for maintaining real-time busy status information for a plurality of telephone extensions of a private branch exchange comprising:

5 a database for storing busy status information for the plurality of telephone extensions;

a server for obtaining signaling information generated by the private branch exchange with respect to private branch exchange telephone extension status,
10 accessing of the database and updating in the database of the busy status information in response to the signaling information; and

a communication link connecting the private branch exchange to the server, the communication link
15 further for effectuating communication between the server and the private branch exchange.

2. The apparatus recited in claim 1, wherein the communication link further includes an interface adapter
20 for converting the signaling information from a protocol used by the private branch exchange into a protocol used by the server.

3. The apparatus related in claim 2, wherein the
25 interface adaptor converts signaling information of the private branch exchange into standard Computer Supported Telecommunications Application protocol.

4. The apparatus recited in claim 3, wherein the
30 communication link is a transport control protocol /Internet Protocol link.

5. The apparatus recited in claim 1, wherein the busy status information is stored in conjunction with
35 directory information.

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6. The apparatus recited in claim 1, wherein the server further operates by retrieving the busy status information from the database and broadcasting the busy status information in real time to a user terminal.

7. The apparatus of claim 1, wherein the server further operates by retrieving the busy status information from the database and communicating the busy status information to a user terminal at the request of the user terminal.

8. The apparatus recited in claim 1, wherein the busy status information further includes a color indicative of the current status of the telephone extension.

9. The apparatus recited in claim 1, wherein the busy status information further includes an icon indicative of the current status of the telephone extension.

10. A method for maintaining real-time busy status information for a plurality of telephone extensions of a private branch exchange comprising the steps of:

obtaining signaling information indicative of a change in status of a telephone extension; end

updating status information for the telephone extension stored in a database.

11. The method recited in claim 10, further comprising the step of converting the signaling information from one protocol to another protocol.

12. The method recited in claim 11, further comprising the step of broadcasting changes in the status information for the telephone extension to at least one subscriber of real-time notification.

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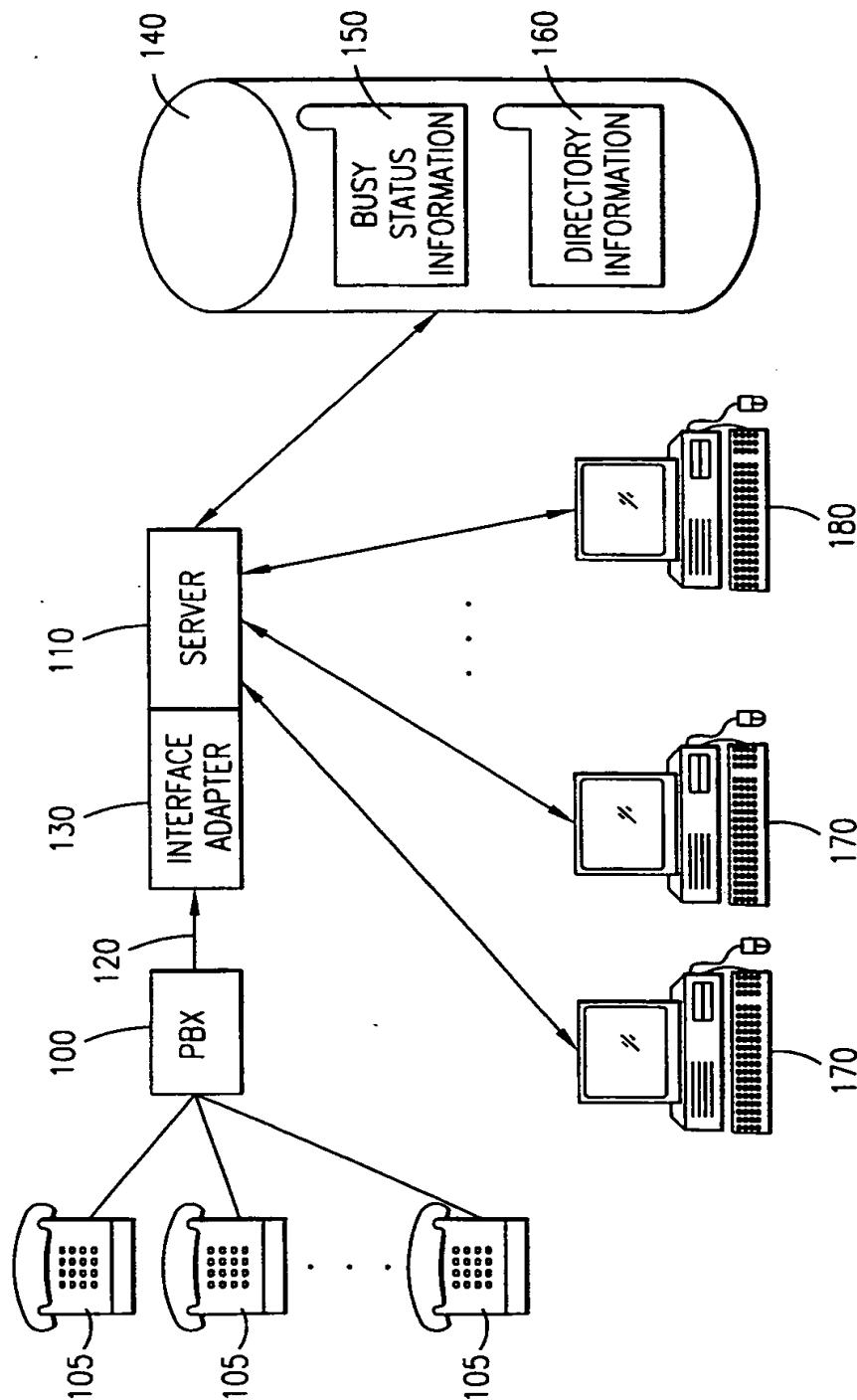
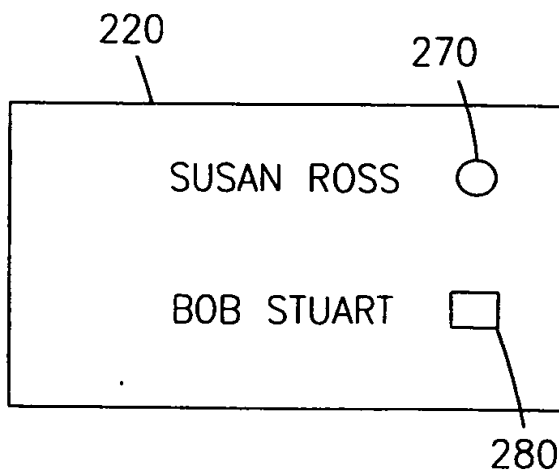
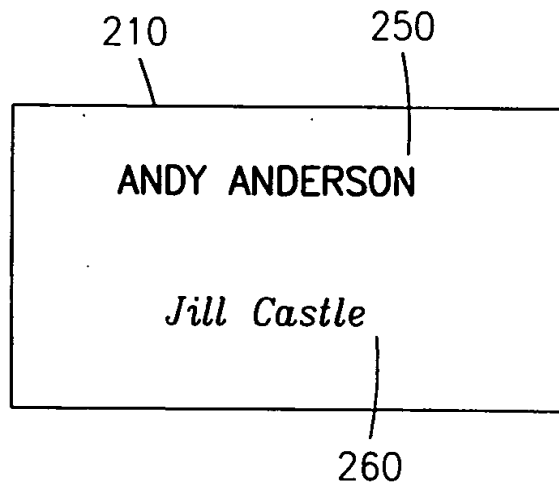
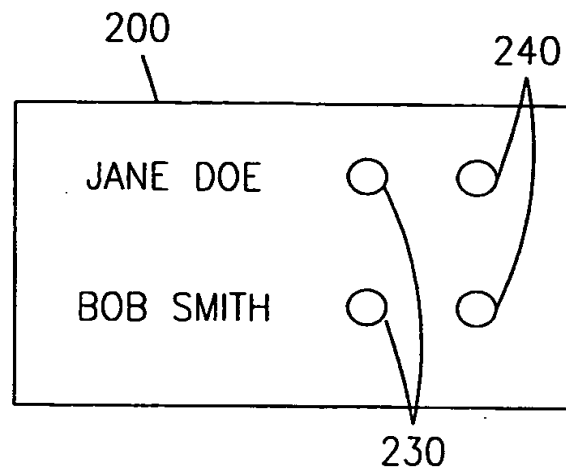
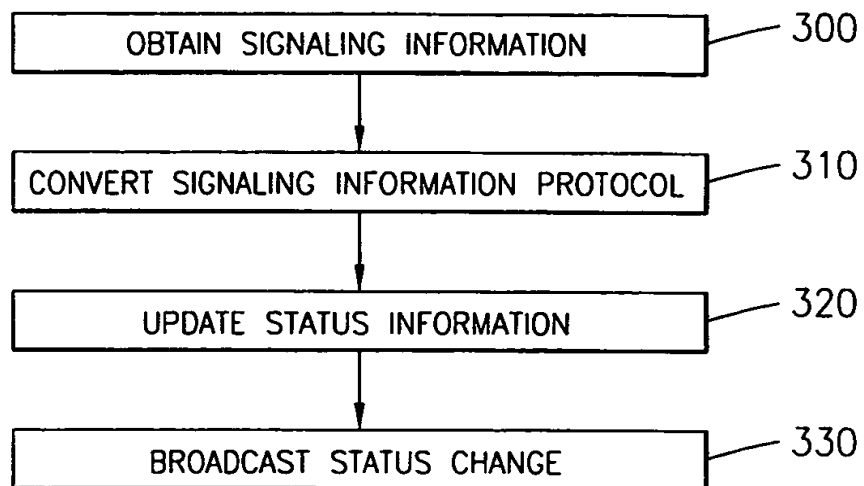


FIG. 1

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**FIG. 2**

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**FIG. 3**

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 98/14762

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M3/22 H04M3/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M H04Q G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 592 963 A (NIPPON TELEGRAPH & TELEPHONE) 20 April 1994 see column 7, line 3 - column 8, line 36; figure 3	1, 10
P, X	EP 0 847 176 A (IBM) 10 June 1998 see column 4, line 47 - column 5, line 56	1, 2, 5-12
P, X	NL 1 006 352 C (NEDERLAND PTT) 22 July 1997 see page 3, line 6 - page 4, line 2; figure 1	1, 2, 10
P, X	WO 97 46955 A (AT & T CORP) 11 December 1997 see claims 1, 8	1, 10

☐ Further documents are listed in the continuation of box C.

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